METHOD AND SYSTEM FOR DYNAMIC ACCOUNTING OF SERVICE AND EQUIPMENT USAGE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a method and system for determining a user fee to be charged by monitoring the service and equipment usage.

Description of the Related Art

The cost of equipment rentals, or other equipment sharing arrangements, are generally charged to the user on the basis of a cost per amount of time used. The practice of time-based user fees has a number of advantages. First, time is something that is easily tracked and monitored by both the user and the equipment provider so that disputes are less likely to arise. Second, people are accustomed to estimating the amount of time that the equipment may be needed. In fact, even the operators of the equipment are typically paid by the hour.

However, there are certain inequities that arise as a result of time-based user fees. For example, a rental car may be quoted as costing a fixed amount per day of rental, regardless of whether the car is driven constantly during the rental period or whether the car is driven only a few miles before being sitting idle for the majority of the rental period. Accordingly, some rental agreements now provide a mileage cap at the fixed rental fee, but charge an additional amount for each mile driven beyond the mileage cap. This additional charge is an acknowledgement that the value of the rental car is not just a function of time, but is also a function of the extent of use.

Quantifying or measuring an amount of car usage is relatively easy given the presence of an odometer and the fact that the number of cars, usually just one, is known at the outset of the rental period. However, there is a need to provide other services and equipment to users in an environment where the user can select the service or equipment as needed and use as much or as little of that service or equipment as determined necessary. For example, an executive suite arrangement can be configured where tenants have a number of business-related services, such as answering service, typing service and the like, and a number of equipment types, such as photocopiers, desks, and the like, made available to them. Charging for executive suite usage is much more complex than for a rental car, since the quantity of service and equipment used is more a function of the usage and less a function of time.

However, some service and equipment usage is even more difficult and time-consuming to measure. In fact, the act of measuring usage of many common services and equipment would be so impractical as to make the measurement more expensive than the service and equipment being sought. As a result, many types of equipment are merely sold to the consumer so that the consumer can use the equipment as much as they want. For example, exercise machines and equipment are typically either sold to individuals for unlimited home use or "rented" to individuals through club memberships that give the consumer access to many exercise machines for a monthly fee. By charging a club membership, all of the various exercise equipment is essentially "bundled" together and the consumer's choice is simply to accept or reject the club membership fee that is offered. Unfortunately, this may be an ineffective pricing scheme for many consumers, such as a runner who will primarily use only one treadmill.

Therefore, there is a need for a method and system for determining a user fee for using a service or equipment that is based on actual usage. Preferably, the user fee is

determined by monitoring actual usage of the equipment, attributing the usage to an individual user, and calculating an appropriate user fee. It would be desirable if the usage were automatically measured by monitoring one or more characteristic of the equipment operation, features, or current demand. It would also be desirable if the user fee was calculated as a function of the usage amount and a rate schedule, wherein the rate schedule takes into account one or more rate factor selected from equipment purchase cost, equipment maintenance cost, building space utilization, features used, current usage or demand for the equipment, and the like.

SUMMARY OF THE INVENTION

The present invention provides a system comprising a memory device and a processor in communication with the memory device. The memory device has one or more database therein for maintaining information relating to a plurality of users and a plurality of devices. The processor is configured to: identify one or more users using a device selected from the plurality of devices that are in communication with the processor, wherein the one or more users are selected from the plurality of users; identify the device used by each of the one or more users; determine, for each of the one or more users, a usage amount attributable to the device; and calculate a user fee for each of the one or more users based on the identity of the device and the usage amount attributable to the device and perhaps also the current demand for the device. Optionally, the processor may be further configured to repeat the foregoing steps for one or more devices, such as fitness equipment, subsequently used by each of the one or more users. Furthermore, the processor may be further configured to accumulate a total of user fees for each of the one or more users. The amount of usage may be measured as a quantity selected from the group consisting of time, repetitions, workload and combinations thereof. It is preferred that the one or more database maintains rate schedules for each of the plurality of devices. The invention allows the possibility that one or more of the rate schedules is variable according to a factor

selected from time of day, day of the week, device type, device features, device location, and combinations thereof. In one embodiment, the processor is further configured to display the user fee on the device during use.

Similarly, the invention provides a computer program product including instructions embodied on a computer readable medium. The instructions comprise: storing instructions for storing information relating to a plurality of users and a plurality of devices; identifying instructions for identifying one or more users using a device selected from the plurality of devices that are in communication with the processor, wherein the one or more users are selected from the plurality of users; identifying instructions for identifying the device used by each of the one or more users; determining instructions for determining, for each of the one or more users, a usage amount attributable to the device; and calculating instructions for calculating a user fee for each of the one or more users based on the identity of the device and the usage amount attributable to the device. The computer program product may further include instructions carry out the same steps as the processor as configured above.

More generally, the invention provides a method comprising: storing information relating to a plurality of users and a plurality of devices; identifying one or more users using a device selected from the plurality of devices that are in communication with the processor, wherein the one or more users are selected from the plurality of users; identifying the device used by each of the one or more users; determining, for each of the one or more users, a usage amount attributable to the device; and calculating a user fee for each of the one or more users based on the identity of the device and the usage amount attributable to the device. The method may further include steps that are carried out by the processor as configured above.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of

the invention, as illustrated in the accompanying drawing wherein like reference numbers represent like parts of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a structural diagram of a distributed data processing system illustrating the relationship of a server with a plurality of equipment users or clients.

FIG. **2** illustrates an equipment user or client communicating with a server in accordance with the present invention.

FIG. **3** illustrates an example of a client-server system connected through a network.

FIG. **4** is an example of a client computer system in which the present invention may be implemented.

FIG. **5** is an exercise apparatus having a plurality of resistance mechanisms, wherein the exercise equipment is shown as a treadmill.

FIG. **6** is a block diagram representation of the controller of the Internet-connected programmable fitness device.

FIG. **7** is a flowchart illustrating the steps taken by the fitness server in accounting for equipment usage.

FIG. **8** is a structural diagram illustrating fitness equipment communicating through the network to the integrated server.

FIG. **9** is a flowchart illustrating the steps taken by the integrated server

FIG. **10** is a flowchart illustrating the steps taken by the electronic exercise profiler.

FIG. **11** is a flowchart illustrating the steps taken by the electronic dietary profiler.

DETAILED DESCRIPTION

FIG. **1** is a structural diagram of a distributed data processing system **10** illustrating the relationship of a central server **11** with multiple equipment clients or devices **12** for communication over a communications system or network **13**, such as the

Internet. The system **10** includes programmable equipment **12** interactively coupled with the integrated server **11** that may be disposed at the same location or a location that is geographically remote from the server **11**. The system **10** of the present invention includes a user database **16** and an equipment database **18** containing instructions for determining a user fee. The equipment devices **12** access the integrated server **11** through the communications system **13**. The interactive coupling permits the equipment **12** to transmit various kinds of user location information to the server **11**. It also permits the server **11** to transmit control information to the equipment **12**. Information can be transmitted between the equipment **12** and the server **11** at any time, specifically including immediately prior to, during, or immediately after use of the equipment. A preferred equipment device or system **12** is shown in more detail in Figure **6**.

Network **13** is the medium used to provide communications links between various devices and computers connected together within distributed data processing system **10**. Network **13** may include permanent connections, such as wire or fiber optic cables, or temporary connections made through telephone or wireless communications. Clients and servers may be represented by a variety of computing devices, such as mainframes, personal computers, personal digital assistants (PDAs), smart phones, and Internet-connected exercise equipment. Distributed data processing system may include additional servers, clients, routers and other devices not shown. In the depicted example, the distributed data processing system **10** may include the Internet with network **13** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. Of course, the distributed data processing system may also include a number of different types of networks, such as, for example, an intranet, a local area network (LAN), or a wide area network (WAN).

The present invention could be implemented on a variety of hardware platforms and could be implemented in a variety of software environments. A typical operating system may be used to control program execution within the data processing system. Furthermore, although the preferred embodiment described below includes a "browser" at the client as the agent which exchanges data in the security protocols with the Web Application Server, the agent at the client does not have to be a conventional browser, e.g., Netscape Navigator® or Microsoft Internet Explorer®. In order to secure the information transmitted to and from the server, the client may be capable of Public Key Infrastructure (PKI) technology exchanged in a security protocol such as the Secure Sockets Layer (SSL) version 3.0 and above.

Web application server **11** includes a conventional server software program such as International Business Machines' Websphere®, for administering the interaction with equipment users. The server software includes application programs that enable the server **11** to manage the equipment database, user database and any other databases and execute various instructions in response to communications from various equipment users or clients **12**.

FIG. **2** is an example of a client attempting to access a server according to the present invention. As illustrated, the user of equipment or workstation **20** seeks access over a computer network **26** to an exercise, usage or dietary record **30** located in a database **28** on a server **22** through the user's web browser **24**. The computer network **26** may be the Internet, an intranet, or other network. Server **22** may be a Web Application Server (WAS) such as WAS **11** shown in FIG. **1**, a server application, a servlet process or the like. Optionally, client **20** submits the required user information to identify itself as being authorized to access the requested information. User information can include data such as a password or a combination of a user identification and password assigned by the server **22**. Web server **22** generates a

graphical user interface that is displayed by the browser **24** providing the individual options to the client.

FIG. **3** depicts an example of a client-server system connected through the Internet **13**. In this example, a remote server system **42** is connected through the Internet to client system **40**. The client system **40** includes conventional components such as a processor **44**, memory **45** (e.g. RAM), a bus **46** which couples the processor **44** and memory **45**, a mass storage device **47** (e.g. a magnetic hard disk or an optical storage disk) coupled to the processor and memory through an I/O controller **48** and a network interface **49**, such as a conventional modem. The server system **42** also includes conventional components such as a processor **54**, memory **55** (e.g. RAM), a bus **56** which couples the processor **54** and memory **55**, a mass storage device **57** (e.g. a magnetic or optical disk) coupled to the processor **54** and memory **55** through an I/O controller **58** and a network interface **59**, such as a conventional modem. It will be appreciated from the description below that the present invention may be implemented in software that is stored as executable instructions on a computer readable medium on the client and server systems, such as mass storage devices **47** and **57** respectively, or in memories **45** and **55** respectively.

FIG. **4** shows a client computer system **60** that can run a browser. The computer system **60** includes a display device **62** (such as a monitor), a display screen **64**, a cabinet **66** (which encloses components typically found in a computer, such as CPU, RAM, ROM, video card, hard drive, sound card, serial ports, etc.), a keyboard **68**, a mouse **70**, and a modem **61**. Mouse **70** may have one or more buttons, such as buttons **65**. The computer requires some type of communication device such as modem **61** that allows computer system **60** to be connected to the Internet. Other possible communication devices include ethernet network cards.

CENTRALIZED FITNESS SYSTEM

The following section describes a centralized fitness system in accordance with the present invention. This description should be taken as an example of the invention as implemented and should not be interpreted as limiting the scope of the invention.

Referring now to FIG. **5**, there is shown an exercise apparatus **12** having a plurality of resistance mechanisms, wherein the exercise equipment **12** is shown as a treadmill. Specifically, the resistance mechanisms are a treadmill drive motor for controlling the speed of the belt **23** and an incline (lift) motor for controlling the lift arm **25**. As previously described, it will be understood that the system of the present invention can be applied to any type of equipment. Thus, the fitness device **12** is set forth only as an illustrative example of the type of equipment wherein the present invention can be advantageously applied. Furthermore, the fitness device **12** set forth is only a single example of the many types of fitness devices that can be used within the fitness system **10**. Additionally, the device **12** may be fully or partially manually operated, such as a handheld personal data assistant ("PDA") into which the user types in data to log his running distance, time, repetitions and the like. The console 94 will include a display that is coupled to a controller located somewhere within the fitness device 12. Most preferably, the controller will operate a browser to facilitate Internet communications with the server and other web sites.

Referring now to FIG. **6**, there is shown a block diagram representation of the controller **20** of the programmable fitness device **12**. The controller **20** can include a microprocessor **72**, a memory **74**, a timer **75** and input/output (I/O) circuitry **76** connected in a conventional manner. The memory **74** can include random access memory (RAM), read-only memory (ROM), or any other type of storage means. The I/O circuitry **76** can include conventional buffers, drivers, relays and the like, such as for driving the motors **23A**, **25A** with sufficient power. Conventional circuitry for

latching output signals from the microprocessor **72** is also ordinarily included in the output circuitry **76**. Thus, output signals from the microprocessor **72**, interfaced though the output circuitry **76**, control the drive motor **23A** and incline motor **25A**.

The output signals of the microprocessor **72** also control the display **98** which can be located on a console **94** of the exercise equipment **12**. It will be understood that information representative of the operation of any of the devices included in the controller **20** can be interactively transmitted from the controller **20** to the server **11** by way of I/O circuitry **76** that is coupled to the Internet or other network system **13**.

Since the speed and incline of the fitness device **12** is determined by the controller **20**, the controller **20** normally has all speed and grade information required to operate the fitness control device **12**. However, it is preferable to include a speed sensor for detecting the actual speed of the fitness device **12** and an incline sensor for determining the actual grade. Sensors suitable for this purpose are well known to those skilled in the art. For example, a speed sensor **78** can be a conventional Hall effect type sensor adapted to provide a value to the controller **20** that indicates the revolutions per minute of the drive roller **21**. The controller **20** can then convert the value received from speed sensor **78** to miles per hour. The incline sensor **80** can be any conventional sensor suitable for the purpose.

In accordance with one aspect of the invention, the resistance levels of the resistance mechanisms **23A**, **25A** of the fitness device **12** can be varied with respect to one another according to the heart rate of the user. Additionally, the heart rate can be monitored for safety reasons by the controller **20** or the server **11**. Accordingly, the fitness device pulse detection circuitry **82** secured to the user by a strap **92** detects the user heart rate. A suitable timer, such as a timer **75**, is used to determine the rate of the pulse signals received from the detection circuitry **82**. Any conventional pulse detection circuitry **82** can be used provided it can supply a signal corresponding to the

user heart rate for the input circuitry **76** of the controller **20**. The pulse detection circuitry **82** can include an electrocardiograph-type detection device that senses electric currents or electrical potentials on the user in order to provide a signal corresponding to the heart rate, or any other type of device that senses user heart rate and provides corresponding signals. The output of a transducer **84** within the pulse detection circuitry **82** can be amplified by an amplifier **86** and transmitted by a transmitter **88** to an I/O receiver **90**.

Using the fitness system, a user at a user location can interact on-line with a live or programmable fitness expert located at the server **11** to engage in a real time two way communication regarding matters related to fitness, including matters such as exercise routines and exercise equipment. For example, the user can obtain advice on modifying an exercise routine as well as technical support information for various kinds of exercise equipment. In addition to interacting with a live fitness expert, a user of the fitness system at the user location can interactively obtain the control information from the server **11**. The communication can include the uploading and downloading of control information, as well as video and audio information, to the fitness device **12**. Such communications can be transmitted over fiber optics, wire or utilize wireless technology, such as Wireless Application Protocol ("WAP") or Bluetooth based communication mechanisms.

The control information transmitted from the server **11** can include control signals for directly controlling the fitness device **12**. However, in a preferred embodiment of the fitness system **10**, the control information from the server **11** can be a fitness equipment control program for execution by the controller **20**. In this preferred embodiment, the controller **20** provides the control signals required for controlling motors **23A**, **25A** according to the control program received from the server **11**. Additionally, a digest of information for each user of fitness system **10** can be accumulated by the server **11** and the control information can be determined

according to the digest as well as the current user location information. For example, the web site can store a plurality of control programs and select a control program from the plurality according to the digest and the current user location information.

Although user location information includes both user and location information it will be understood that the user location information at the server **11** can be associated with the actual user rather than any particular geographic location. In this way the user can use fitness system **10** from any location or piece of exercise equipment.

Using the network **13** the user of the fitness system **10** can provide user location information, such as personal identification, heart rate, weight, age and gender, from the user location to the server **11**. The user location interactively applies and receives the interactive information from the server through the network

Device information such as speed, incline and suspension can also be communicated by the user or automatically by way of the Internet system **13**. Any other information useful for interaction between the user location and the server **12** can also be applied to the Internet system **13**. The user information and the device information can be used by the server **11**, as well as by the controller **20**, to calculate, for example, calorie information. Calorie information calculated in this manner can be used to provide control signals for controlling the fitness device **12** according to the calorie information, both in a current exercise session and in a future one. Information within the fitness system **10** can also be interactively communicated to and from third party applications. An Internet browser **17** permits the user of equipment **12** to browse the Internet system **13** both during and between exercise sessions.

In a preferred embodiment, the rate schedule includes instructions for adjusting the rate charged to users on the basis of current demand for the equipment being used. The current demand may be monitored in various ways, including the use of a

pressure-sensitive mat or demand sensor **81** placed on the floor adjacent the equipment on which someone waiting for use of the equipment can stand. Alternatively, demand may be registered by a PDA-operated reservation-type system in which individual's that want to use the equipment transmit a request to the equipment controller to reserve a place in line. The controller may communicate to the PDA how many other individuals are waiting on the equipment, estimate the wait time, and notify the individual when it is their turn. In some contexts, it may be appropriate to have an auction-type system that awards use of the equipment to the highest bidder.

FIG. **7** is a flowchart illustrating the steps taken by the fitness server **11** in accounting for equipment usage. In state **102**, the server receives a transmission that allows the server to identify the user and the equipment being used. In state **104**, the server determines the rate schedule to be applied based upon the identified user, the identified equipment, current demand conditions, and any promotional considerations. In state **106**, the server monitors the amount of usage attributable to the user and the identified equipment. Only upon detecting that the equipment has become idle in state **108**, does the server create an event record to be stored in the accounting database in state **110**. At a minimum, the event record will debit the users account. More preferably, the event record will record the identified user, identified equipment, user performance information (such as distance, calories, weight, etc.), a time stamp, and any special pricing considerations. The server utilizes the data in the event record to calculate the user fee, preferably using an algorithm that considers demand conditions at the time the equipment was used. In this later manner, the user can be provided with a fully detailed accounting that explains the amounts charged to him. If the user is identified as moving to another device in state **112**, then the process returns to state **102**. However, if the user is not identified as using any equipment for a timeout period, then the server in state **114** considers the user's

session to be complete. Accordingly, the user's health and fitness profile may be updated.

FIG. **8** is a structural diagram illustrating fitness equipment **12** communicating through the network **13** to the integrated server **11**. The integrated server **11** includes, or is in communication with, an accounting system or server **130** for determining the user fees to be charged for using one or more fitness device **12**. In making a user fee determination, the accounting server **130** must execute certain instructions maintained in the usage pricing database **132** relating to the extent of usage, but preferably also including other instructions relating to the demand for the equipment. These other instructions include, but are not limited to, charging more during busy periods or when there is a long waiting line (high user demand), charging more for the most popular devices, charging less during off-peak hours, charging less during a promotional period, preferential treatment for identified customers, and the like. The usage pricing database **132** is also responsible for maintaining user event records, or at a minimum accumulating total user fees, so that the appropriate amounts can be charged to each user.

The structure in FIG. **8** illustrates a preferred fitness system that includes, or is in communication with, an exercise profiler or server 134 and a dietary profiler or server 138. The electronic exercise profiler 134 maintains the exercise habits and activity database 136 that tracks exercise habits of individual users by storing prior exercise data to create a user exercise profile. Preferably, the fitness profiler 134 communicates with the equipment 12 that is identified as being used by a user that has a fitness profile therein. The communication may include a control signal that automatically performs fitness settings, selected exercise programs and settings (such as duration, level, and type of exercise), or acts as a consultant providing advice. The electronic dietary profiler 138 maintains the diet profile database 140 for making

appropriate diet suggestions or menus and, optionally, receiving and storing calorie intake information such as by scanning food items.

FIG. **9** is a flowchart illustrating the steps taken by the integrated server **11**. In states **150** and **152**, the integrated server consults the electronic exercise profiler and the electronic dietary profiler, although the order of these steps is not important. In state **154**, the integrated server creates a representation of an integrated profile. The user is then advised, in state **156**, regarding fitness settings, as well as fitness and dietary advise. Upon conclusion of the exercise event as set out in FIG. **7**, the server **11** updates, in state **158**, the exercise database **136** and the dietary database **140** with data about the user's activity. Specifically, the exercise database **136** may be given data about speed, incline, duration, and heart beat, while the dietary database **140** may be given data about the number of calories burned and the manually entered weight of the user. If there are no other detected events for the user, as determined in state **160**, then the process exits in state **162**. However, if the user begins another exercise or requests additional advise, then the process may return to state **150**.

FIG. **10** is a flowchart illustrating the steps taken by the electronic exercise profiler **134** during state **150** of FIG. **9**. In state **170**, the electronic exercise profiler tracks exercise habits and activities that are either manually entered or automatically received from the equipment **12**. In state **172**, the profiler communicates fitness settings and/or programs to the fitness equipment **12** that are selected on the basis of the exercise habits and activities tracked in state **170** and stored in database **136** during previous exercise sessions. The user's exercise profile is then updated in state **174**. If there are no other detected events for the user, as determined in state **176**, then the process exits in state **178** (moving to state **152**). However, if the user begins another exercise or requests additional advise, then the process may return to state **172**.

FIG. **11** is a flowchart illustrating the steps taken by the electronic dietary profiler **138** during state **152** of FIG. **9**. The profiler **138** consults with the users dietary profile stored in the database **140** in state **180**. Based upon the dietary profile, perhaps including the user's weight, exercise frequency and calories burned, and any nutritional information scanned or manually provided, the profiler **138**, in state **182**, provides dietary advise or suggestions to the user on the display **94** of equipment **12**. The user's dietary profile in database **140** is then updated in state **184**. If there are no other detected events for the user, as determined in state **186**, then the process exits in state **188** (moving to state **154**). However, if the user begins another exercise or requests additional advise, then the process may return to state **182**.

It will be understood from the foregoing description that various modifications and changes may be made in the preferred embodiment of the present invention without departing from its true spirit. It is intended that this description is for purposes of illustration only and should not be construed in a limiting sense. The scope of this invention should be limited only by the language of the following claims.